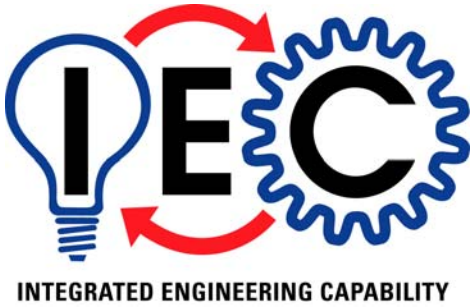

Integrated Engineering Capability (IEC) Overview

July 12, 2006

Mission

The Integrated Engineering Capability mission is to improve the accuracy, availability, and control of engineering data through establishment of data automation and integration capabilities based on MSFC policies and processes.

Project Responsibilities

Leading Development and Implementation of the MSFC Design and Data Management System (DDMS) - A web-enabled Product Lifecycle Management (PLM) tool that provides an infrastructure for managing engineering and project data, including documents, change requests, CAD, parts, procedures, and quality records.

Managing Legacy Configuration Management and Collaboration Tools - Virtual Research Center (VRC), Integrated Configuration Management System (ICMS), Change Processing, Tracking, and Accounting System (CPTAS), Engineering Order (EO) Number Request and Trending System, MSFC Review Item Discrepancy System (RIDS).

Managing CAD Licensing and Leading MSFC CAD Transition to Pro/Engineer (Pro/E)

- Licenses
- Training
- Design Standards
- Adoption
- CAD Management and Inter-Center Collaboration
- Migration/Translation
- Analytical Tools

Alignment to Agency Strategy

The IEC Project aligns directly with the 2003 NASA Strategic Plan[1], OneNASA[2], CAIB[3], The Vision for Space Exploration[4], and NASA's Direction for 2005 and Beyond[5] by:

- establishing collaborative engineering capabilities
- improving data management and control
- providing CAD design, translation, and integration capabilities
- providing as-designed vs as-built product management
- reducing life-cycle costs
- providing project metrics and management decision tools

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[1] 2003 NASA Strategic Plan implementing strategy, IS-3 - "*implement collaborative engineering capabilities and integrated design solutions to reduce the life-cycle cost and technical, cost, and schedule risk of major programs"*.

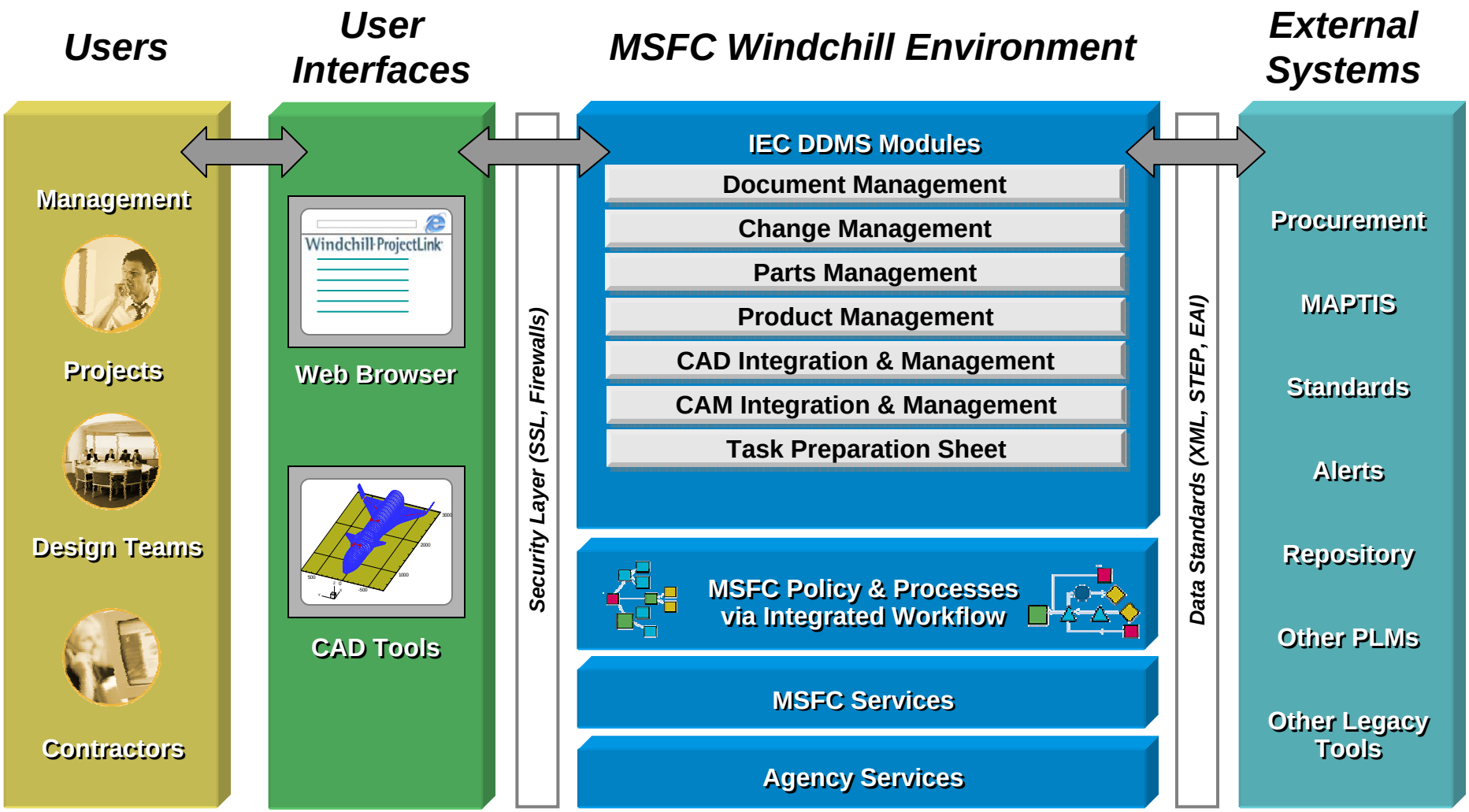
[2] OneNASA recommendation 6 - "*enhance cross-Agency collaboration by putting in place common engineering and collaborative tools and databases, processes, and knowledge-sharing structures*".

[3] CAIB finding F7.4-11 - "*the Space Shuttle Program has a wealth of data tucked away in multiple databases without a convenient way to integrate and use the data for management, engineering, or safety decisions*" and finding F10.3-1 - "*the engineering drawing system contains outdated information and is paper-based rather than computer-aided*".

[4] The Vision for Space Exploration - "*develop the innovative technologies, knowledge, and infrastructures both to explore and to support decisions about the destinations for human exploration*".

[5] NASA's Direction for 2005 and Beyond, NASA's Guiding National Objective #3 - "*Develop innovative technologies, knowledge, and infrastructure both to explore and to support decisions about the destinations for human exploration."*

DDMS Framework



DDMS Support for Project Lifecycle

Formulation / *Implementation*

Concept	Development	Production	Operational	Retirement
Mission Studies Operational Concepts Work Breakdown Project Plan Trade Studies Requirements RFP/Proposals	Simulations/Analyses Drawings/CAD Models Baseline Design **Change Requests/RIDs** **Task Planning** **Test Procedures** **Schedules** **Action Items** *Standards*	Verification Results **Waivers/Deviations** **CAM/Manufacturing** **Parts Management** **As-Designed vs As-Built** **Redlines/EOs** *Alerts* *Procurement* *Materials Certification*	Mission Analysis	Failure Analysis Lessons Learned **Retention Schedules** *Archiving*

IEC DDMS

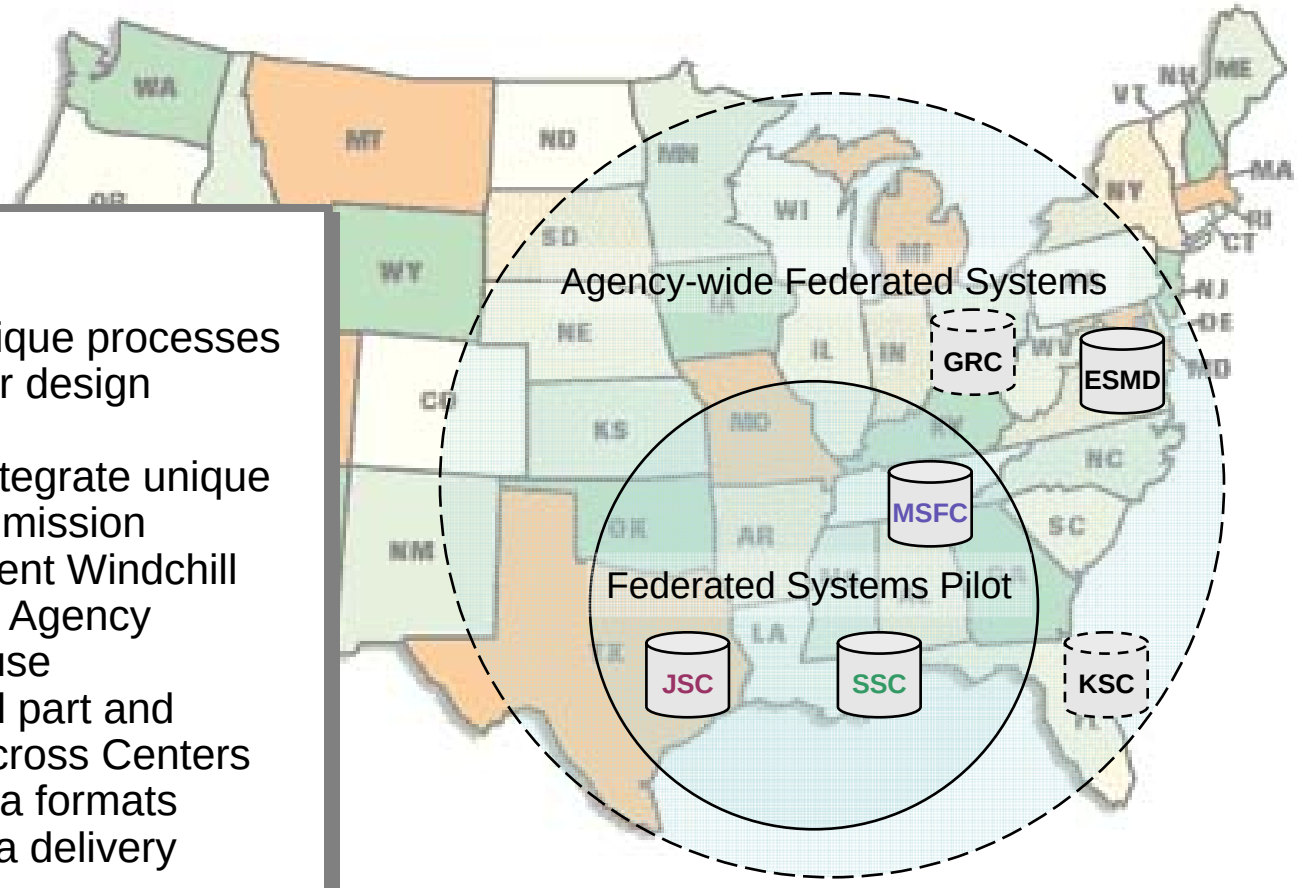
Windchill ProjectLink (Project View / Collaboration Space)	Windchill PDMLink (Product Structure View / Configuration Control)

Managed Data Object (Developed Externally, Controlled in Windchill)
Managed Data Content (Content Input Directly into Windchill, Controlled in Windchill)
Integrated Data Content (Developed and Controlled in External System, Linked to Windchill)

Federation Concept

Develop and implement pilot to federate JSC and MSFC Windchill environments

Expand federation framework across Agency to tightly integrate engineering systems

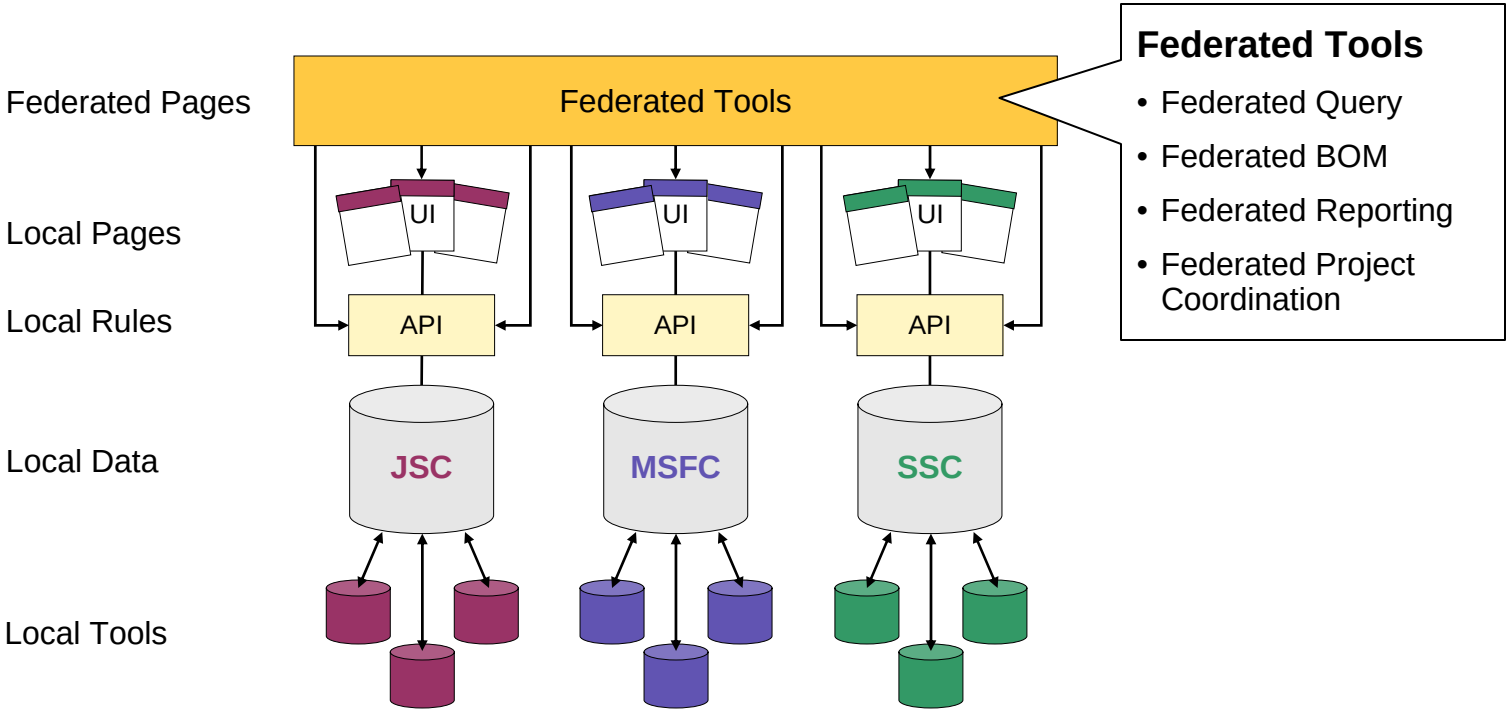


Federation Drivers

- ✓ Allow for Center unique processes
- ✓ Improve inter-center design collaboration
- ✓ Allow flexibility to integrate unique tools tied to Center mission
- ✓ Leverage independent Windchill investments across Agency
- ✓ Increase design reuse
- ✓ Establish integrated part and product structure across Centers
- ✓ Foster common data formats
- ✓ Simplify vendor data delivery

Federation Model

Center Integration through Federated Tools will provide broader visibility across the Agency, but defer most of the management responsibility to local systems.



DDMS Focus Areas

INTEGRATED ENGINEERING CAPABILITY

DDMS Core Capability

	Consolidating Tools & Migrating Data	Automating Manual Processes	Integrating with External Systems	Embedding MSFC Policies
Document Management 1.0	MPDMS VRC	Sensitive Data Control (ITAR/EAR, SBU) DRDs, Deliverables Master Lists	NISE Agency Standards	MPR 1600.1 MPD 2190.1 MPR 7120.3, MWI 7120.2 MSFC-STD-555
Change Management 1.0	FM Rids RIDS	ECRs, Directives Boards Records Management CM Reports/Metrics	Repository (Documentum)	MPD 2210.1 MPR 1440.2 MPR 8040.1 MSFC-STD-3394
CAD Management 2.0	VIPA TeamCenter CAD Libraries Legacy CAD Data	Design Standards	CAD Translation	MSFC-STD-2806
Part Management	Electrical Parts DB Design Packaging DB EEE Parts DB Flight H/W Parts DB	Parts Lists (EPL)	JSC DDMS Federation Procurement	MPD 2800.1 MSFC-STD-555 MSFC-STD-3012
Product Management	ICMS/CPTAS ABCSS EO # Request System	Drawing Release Green Sheets	MAPTIS Alerts	MPR 8040.1 MPR 8040.2 MSFC-STD-555
Procedure Management	WATS/eTPS		SSC DDMS Federation	
Manufacturing Support	Visual (Quality)	Redrawing CAD Tool Path Generation Drawing Redlines, EO's MRB	Delmia	MSFC-STD-555

DDMS Benefits

*Improved **accuracy** of engineering data*

- Increased efficiency and accuracy in reporting on as-built vs as-designed product structure.
- Improved ability to translate and integrate CAD models from contractors or other Centers.
- Reduced data re-entry and errors due to non-integrated and incompatible design systems.

*Improved **availability** of engineering data*

- Improved design collaboration within MSFC and externally to other Centers and contractors.
- Improved collaboration and re-use of part/CAD libraries internal and external to MSFC.

*Improved **control** of engineering data*

- Improved data configuration control and accuracy over paper-based processes.
- Simplified approval routing resulting from automated processes/workflow.
- Streamlined Records management and archival control through integration with repository.
- Improved handling of sensitive data (e.g., ACI, ITAR) through system enforced rules.

*Resulting in **reduced costs** for administration, maintenance, and operations with **improved efficiencies** through consolidation of redundant engineering data management systems and automation of manual process.*

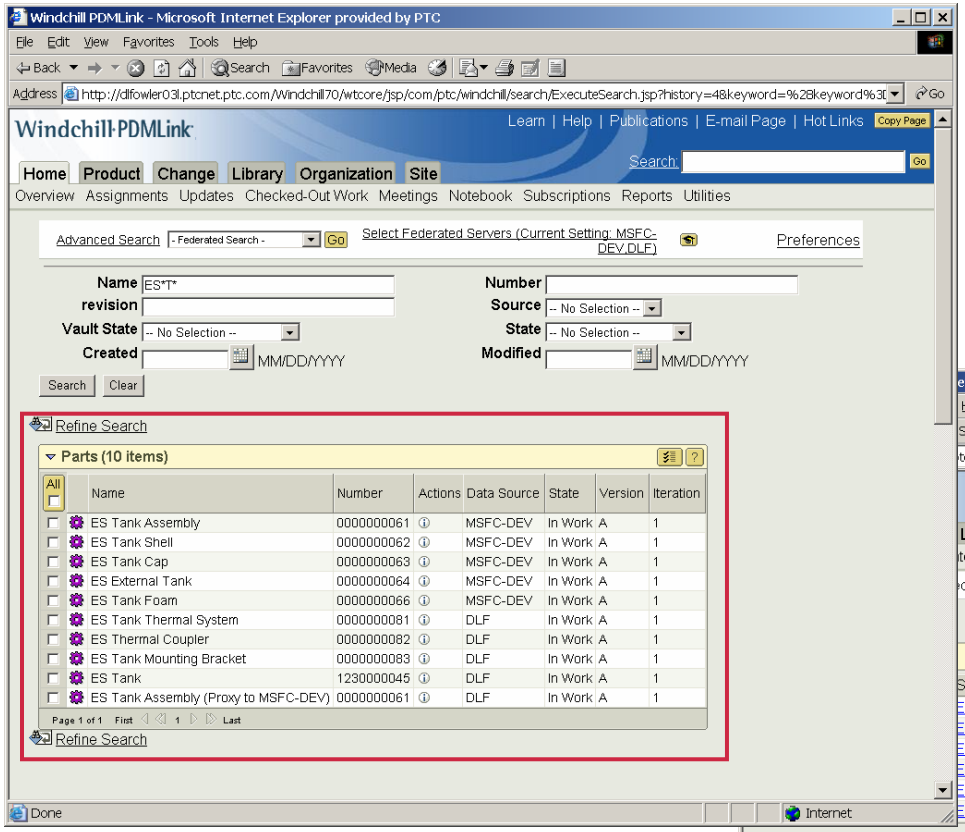
Back-up

Federation Accomplishments

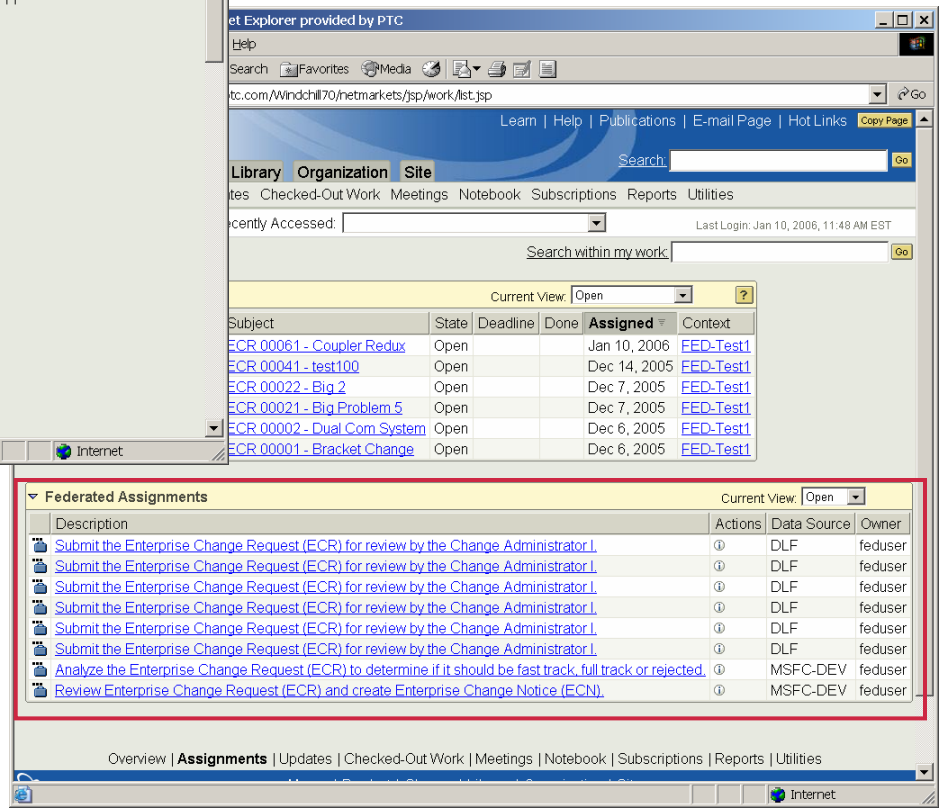
- Investigated and identified key collaboration areas based on Centers' core functions and missions.
- Developed and validated a federated technology framework for sharing data safely and reliably across Center boundaries.
  - Established ability to query across multiple Center part and product structures that can be extended to all other Windchill areas.
  - Created ability to link data structures across Center boundaries and across projects (e.g., CEV to CLV).
  - Developed capability to launch and synchronize processes between multiple Center Windchill environments.
- Defined initial minimum set of common part attributes.
- Implemented a core prototype capability for sharing data across Center boundaries that is robust and conceptually easy for end-users to understand.
- Procured CAD translation tools to improve Centers' capabilities to standardize design tools and advance designs between Centers.

Federated Search and Assignments

INTEGRATED ENGINEERING CAPABILITY



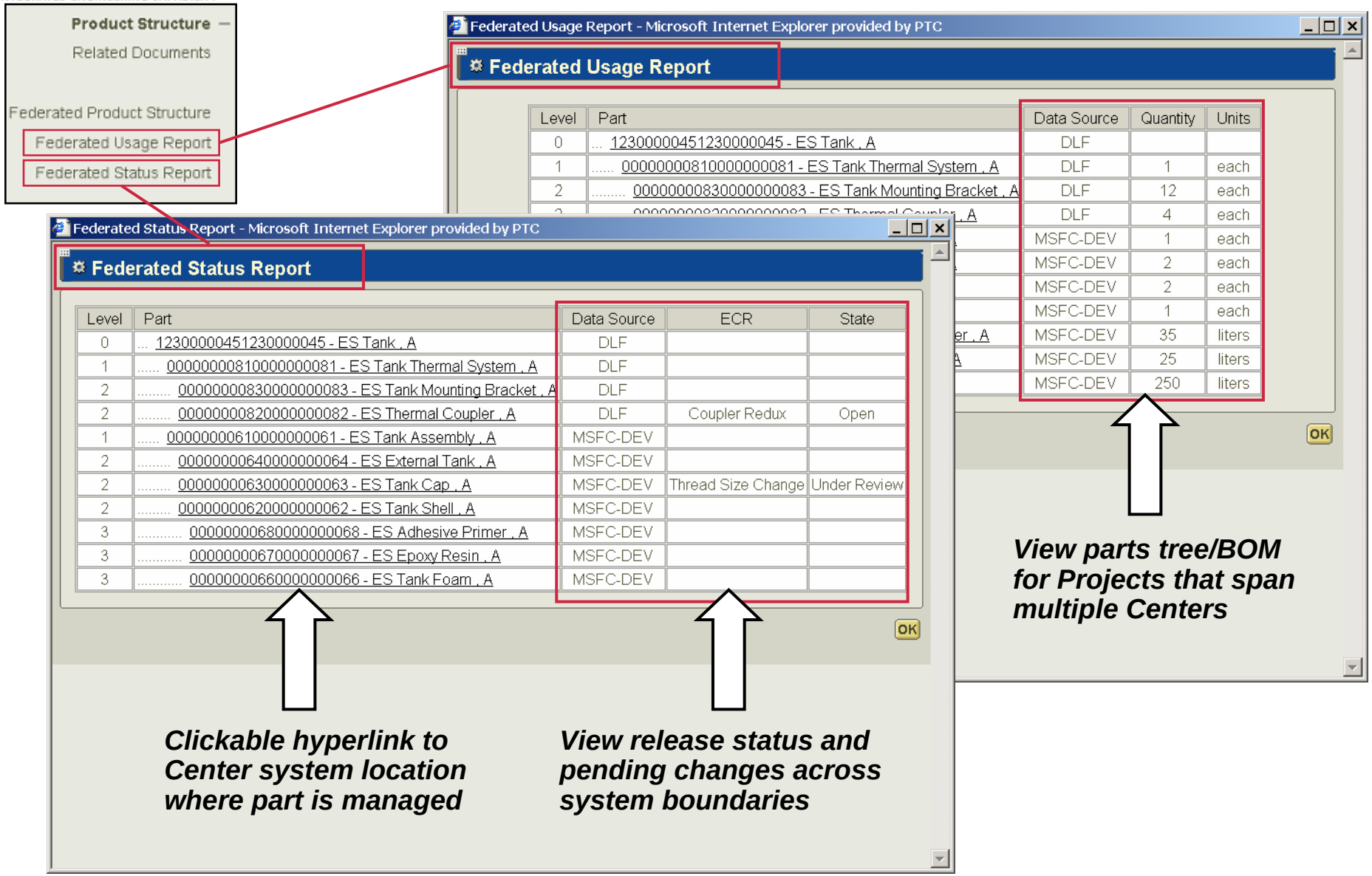
Search for Parts and Documents Across Centers



Consolidate actions and work assignments across multiple Center systems in one location

Federated Reporting Framework

INTEGRATED ENGINEERING CAPABILITY



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